

BEAM STOPPER FOR X-RAY BEAMLINE

Application

The beam stopper is installed in the X-ray beamline, at LNF¹-INFN and was designed in order to stop the entire incident radiation within the shutter block, avoiding any internal cooling circuit. The beam stopper is interlocked to the security system of the beamline and provided with a remotely controlled pneumatic actuator.

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1 References

This product was produced, tested and delivered by CECOM for "LNF" (Laboratori Nazionali di Frascati – Rome – ITALY). The references of contact persons for this work are available under request.

2 CECOM activities

CECOM carried out the following activities:

- Purchase of raw materials
- Manufacturing of components
- Assembling
- Cleaning
- Testing

2.1 Materials and installed equipment

The following materials were used for this application:

- OFHC copper: shutter block
- Stainless steel: vessel and shaft

The beam stopper is equipped with the following devices:

- Micro-switches (normally open)
- Pneumatic actuator
- Connectors for electronic devices and for the pneumatic actuator

¹ Laboratori Nazionali di Frascati (National Laboratory of Frascati) – Rome - ITALY

2.2 Manufacturing, assembling and cleaning process

The geometry of the vacuum vessel and of the shutter block was conceived in order to prevent the block from heating due to the energy deposited by the incident photon beam when the shutter is closed. The transversal section of the cylindrical shutter block was cut on the bottom, in such a way to allow a reasonable portion of the block to remain in contact with the base of the vessel at shutter closed. The possibility of cooling the base plate of the vessel has been provided. This solution allowed to obtain the required cooling performances, using ex-vacuum cooling circuits only. The diameter of the section of the shutter block has been set in order to assure a good overlap between the block and the inlet/outlet pipe at shutter closed, thus preventing eventual scattered radiation from exiting the shutter vessel. The beam stopper is driven by a pneumatic actuator and the edge-welded bellow (guaranteed for 10^6 cycles). The layout of the design is represented in Fig. 1. Each of the two vertical guides supporting the mechanics for vertical movements have been equipped with 4 couples of micro-switches (2 for the open position and 2 for the closed position), which are used to provide a redundant signal to the security system and to the system of interlocks of the beamline.

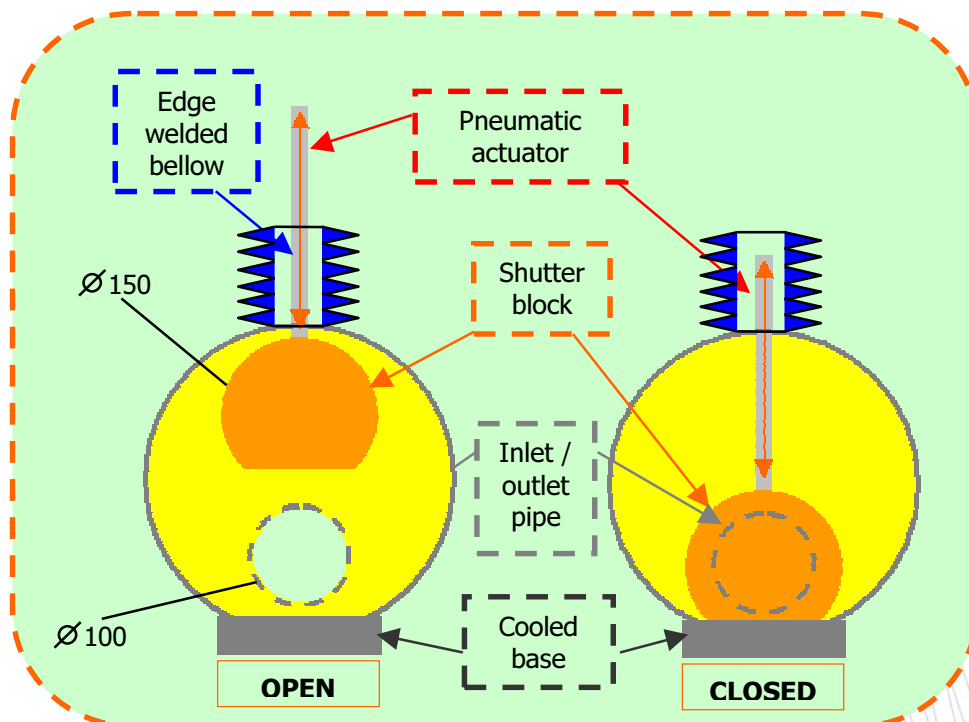


Fig. 1: Sketch of the design of the beam stopper

2.3 Vacuum performances (UHV)

The vessel has been tested for leak tightness, for a maximum leak rate of 10^{-10} mbar·l/s. During normal operation a nominal pressure of 10^{-9} mbar is maintained inside the shutter vessel and no significant variations of pressure have been observed while opening and closing the shutter.

3 Pictures

